

Pre-class

- 1) Read and highlight the handout (would have been yesterday's notes)
- 2) Compare and contrast CLAYS and SANDS
 - 1) Include these phrases
"pore size" and "Surface area to volume ratio"
- 3) Have your binder out for POP QUIZ BINDER CHECK! ☺

3-3 What Are the Major Components of an Ecosystem?

- **Concept 3-3A** Ecosystems contain living (biotic) and nonliving (abiotic) components.
- **Concept 3-3B** Some organisms produce the nutrients they need, others get their nutrients by consuming other organisms, and some recycle nutrients back to producers by decomposing the wastes and remains of organisms.

Ecosystems Have Living and Nonliving Components

- **Abiotic**
 - Water
 - Air
 - Nutrients
 - Rocks, sand, soil, clay, gravel...
 - Heat
 - Solar energy
- **Biotic**
 - Living and once living

Major Biotic and Abiotic Components of an Ecosystem

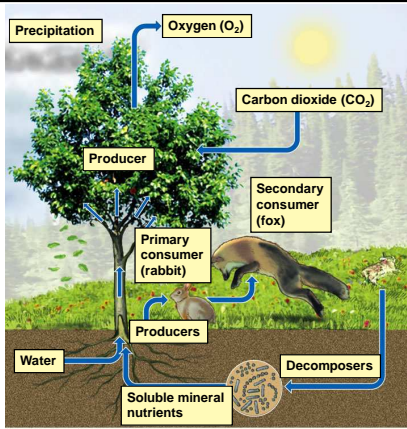
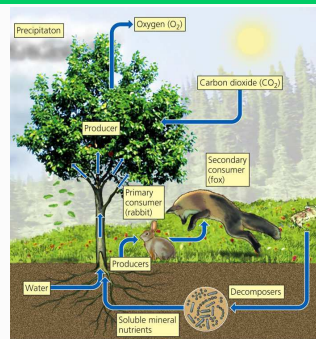
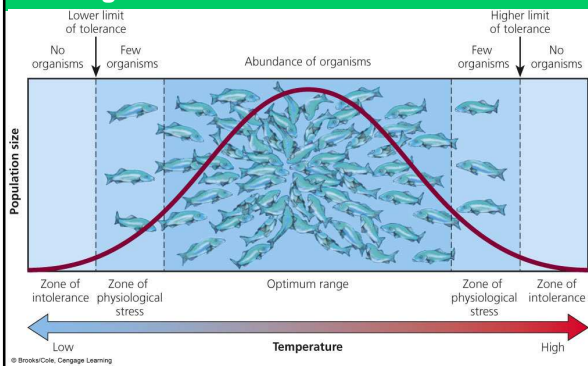
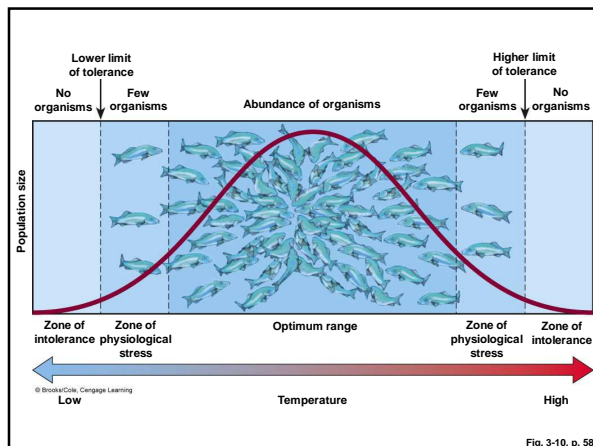


Fig. 3-9, p. 57

Range of Tolerance for a Population of Organisms





Several Abiotic Factors Can Limit Population Growth

■ Limiting factor principle

- Too much or too little of any abiotic factor can limit or prevent growth of a population, even if all other factors are at or near the optimal range of tolerance

Producers and Consumers Are the Living Components of Ecosystems (1)

- **Producers, autotrophs**
 - Photosynthesis
 - Chemosynthesis
- **Consumers, heterotrophs**
 - Primary
 - Secondary
 - Third and higher level
- **Decomposers**

Producers and Consumers Are the Living Components of Ecosystems (1)

- **Producers, autotrophs**
 - Photosynthesis – store sun's energy in chemical bonds
 - Plants, algae
 - Chemosynthesis – store energy from a natural gradients (temperature or chemical) into chemical bonds
 - Ex: Strange organisms deep in the ocean by hydrothermal vents

Consumers

- **Consumers, heterotrophs**
 - Primary – eat producers
 - Ex: Caterpillar, rabbit, grasshoppers
 - "Herbivores"
 - Secondary – eat primary consumers
 - Ex: Blue Jay (bird),
 - "Carnivores" or "omnivores"
 - Third and higher level
 - Ex: Hawk (Bird of prey)

Consumers, continued

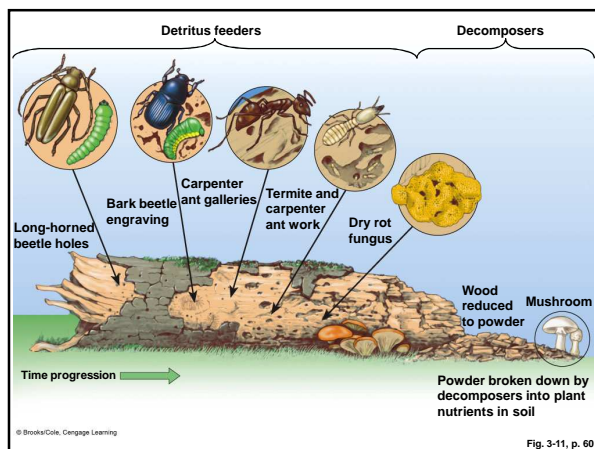
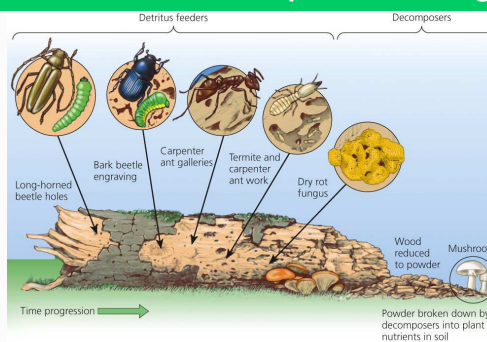
- **Decomposers**
 - Primarily bacteria and fungi
 - Return nutrients from dead plants and animals back into the soil for producers to re-use
 - They can secrete enzymes that speed up the break-down of bodies of dead organisms into nutrient compounds (water, CO₂, minerals, etc...)

Consumers, continued

Detritivores

- “Detritus feeders” eat the waste or dead bodies of other organisms (“detritus”)
- Ex: Mites, earthworms, catfish, some insects, and vultures (“scavengers”)

Detritivores and Decomposers on a Log



Two types of cellular respiration

Aerobic respiration

- Metabolic process that uses O_2 to break glucose down into CO_2 and H_2O

Anaerobic respiration, fermentation

- Metabolic processes in the absence of O_2
- Can produce ethanol, methane, acetic acid, hydrogen sulfide...instead of CO_2 and H_2O
- These are the “stinky” processes!

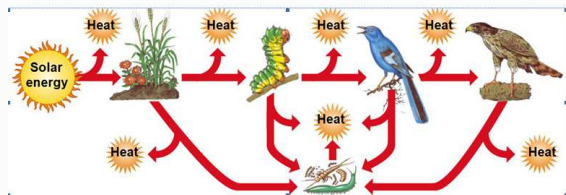
Exit Ticket

- Make a simple food web for **YOURSELF** today – are you an omnivore, a carnivore or an herbivore?

Pre-class

- 1) Turn in HW
- 2) Complete WS

Label each trophic level



12/3: Ecosystems, Continued

Chapter 3

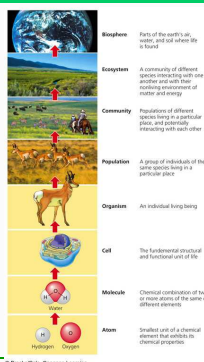
3-1 What Is Ecology?

- **Concept 3-1** Ecology is the study of how organisms interact with one another and with their physical environment of matter and energy.

Species Make Up the Encyclopedia of Life

- **Species**
- 1.75 Million species identified
- Insects make up most of the known species
- Perhaps 10–14 million species not yet identified

Some Levels of Organization of Matter in Nature



Ecologists Study Connections in Nature

- **Ecology**
- Levels of organization
 - **Population**
 - Genetic diversity
 - **Community**
 - **Ecosystem**
 - **Biosphere**

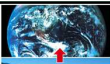





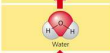
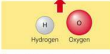
Biosphere		Parts of the earth's air, water, and soil where life is found
Ecosystem		A community of different species interacting with one another and with their nonliving environment of matter and energy
Community		Populations of different species living in a particular place, and potentially interacting with each other
Population		A group of individuals of the same species living in a particular place
Organism		An individual living being
Cell		The fundamental structural and functional unit of life
Molecule		Chemical combination of two or more atoms of the same or different elements
Atom		Smallest unit of a chemical element that exhibits its chemical properties

Fig. 3-3, p. 52

3-2 What Keeps Us and Other Organisms Alive?

- **Concept 3-2** Life is sustained by the flow of energy from the sun through the biosphere, the cycling of nutrients within the biosphere, and gravity.

The Earth's Life-Support System Has Four Major Components

- **Atmosphere**
 - Troposphere
 - Stratosphere
- **Hydrosphere**
- **Geosphere**
- **Biosphere**

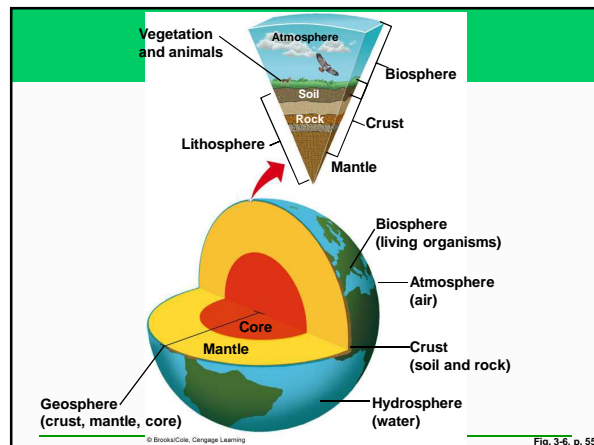


Fig. 3-6, p. 55

Three Factors Sustain Life on Earth

- **One-way flow of high-quality energy** beginning with the sun
- **Cycling of matter or nutrients**
- **Gravity**

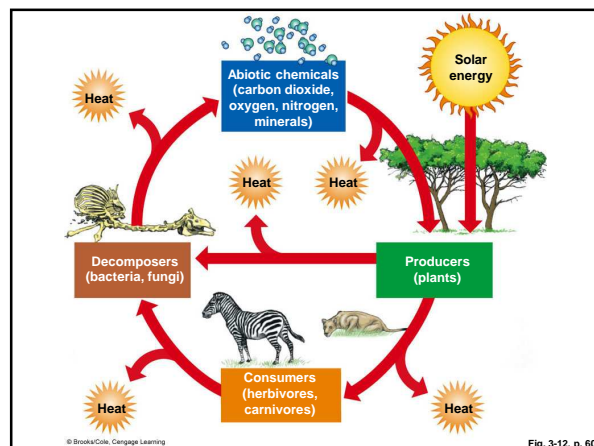


Fig. 3-12, p. 60

3-4 What Happens to Energy in an Ecosystem?

- **Concept 3-4A** Energy flows through ecosystems in food chains and webs.
- **Concept 3-4B** As energy flows through ecosystems in food chains and webs, the amount of chemical energy available to organisms at each succeeding feeding level decreases.

Energy Flows Through Ecosystems in Food Chains and Food Webs

- **Food chain**
- **Food web**

A Food Chain

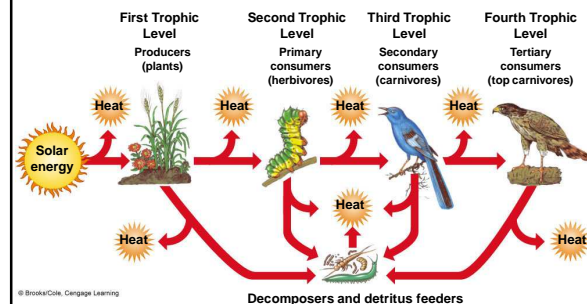
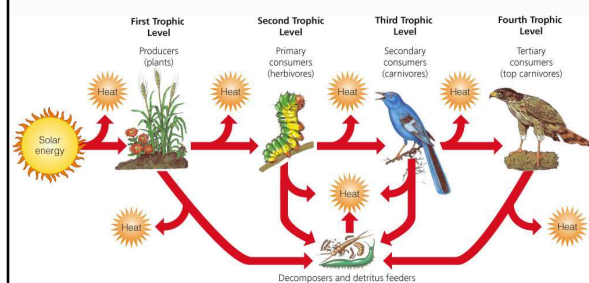
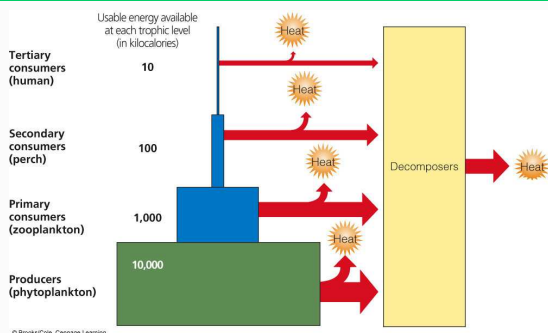


Fig. 3-13, p. 62

Pyramid of Energy Flow



3-5 What Happens to Matter in an Ecosystem?

- **Concept 3-5** Matter, in the form of nutrients, cycles within and among ecosystems and the biosphere, and human activities are altering these chemical cycles.

Nutrients Cycle in the Biosphere

- **Biogeochemical cycles, nutrient cycles**
 - Hydrologic
 - Carbon
 - Nitrogen
 - Phosphorus
 - Sulfur
- Connect past, present, and future forms of life

Water Cycles through the Biosphere

- Natural renewal of water quality: three major processes
 - Evaporation
 - Precipitation
 - Transpiration
- Alteration of the hydrologic cycle by humans
 - Withdrawal of large amounts of freshwater at rates faster than nature can replace it
 - Clearing vegetation
 - Increased flooding when wetlands are drained

Hydrologic Cycle Including Harmful Impacts of Human Activities

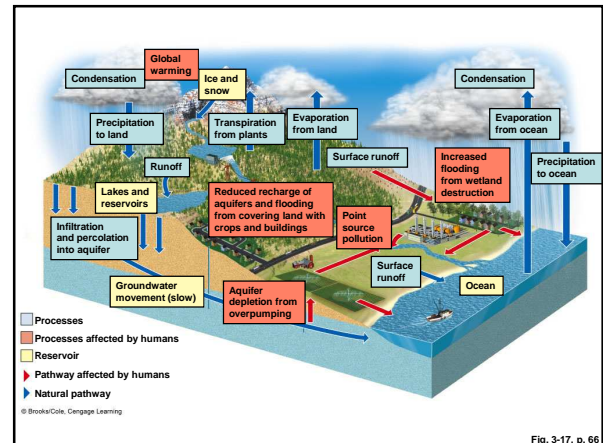
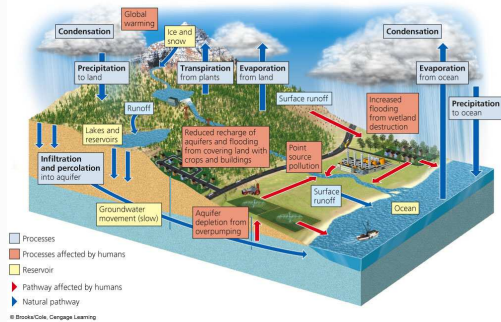


Fig. 3-17, p. 66

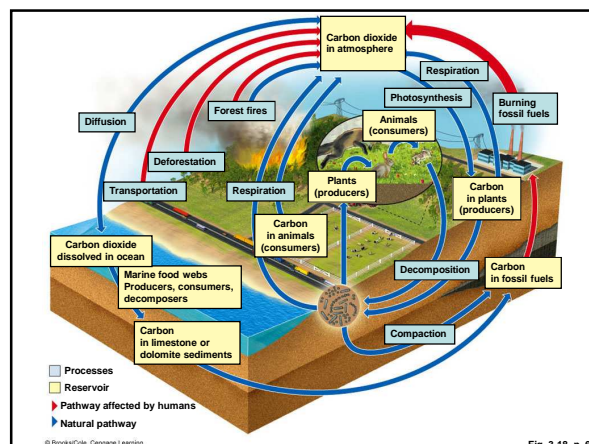
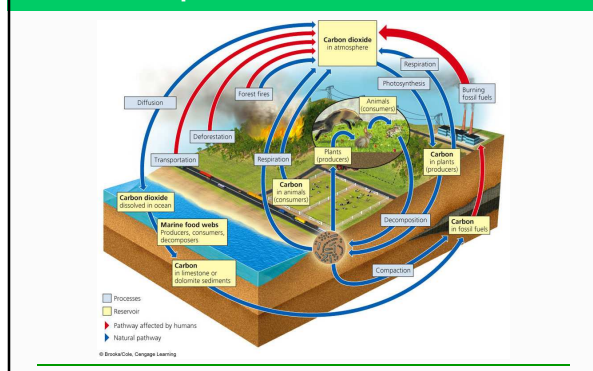
Science Focus: Water's Unique Properties

- Properties of water due to **hydrogen bonds** between water molecules:
 - Exists as a liquid over a large range of temperature
 - Changes temperature slowly
 - High boiling point: 100°C
 - Adhesion and cohesion
 - Expands as it freezes
 - Solvent
 - Filters out harmful UV

Carbon Cycle Depends on Photosynthesis and Respiration

- Link between photosynthesis in producers and respiration in producers, consumers, and decomposers
- Additional CO₂ added to the atmosphere
 - Tree clearing
 - Burning of fossil fuels

Natural Capital: Carbon Cycle with Major Harmful Impacts of Human Activities



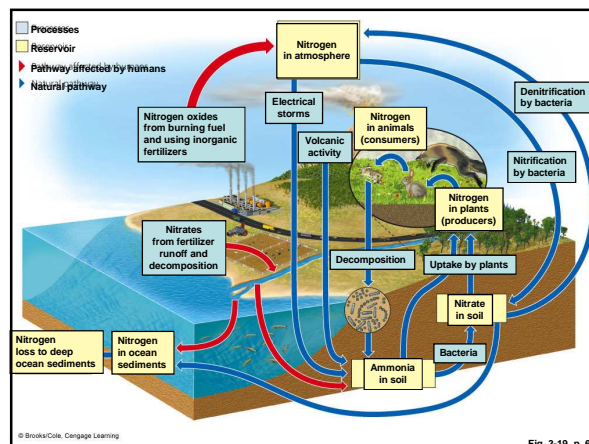
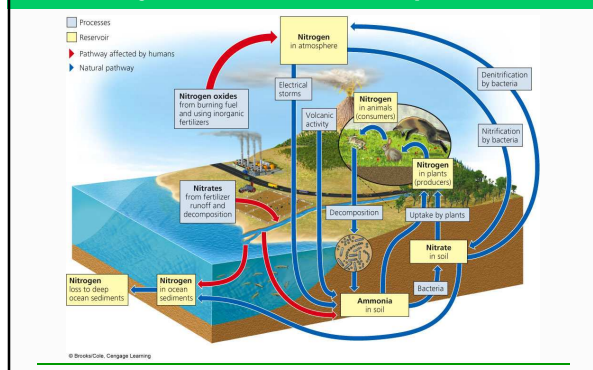
Nitrogen Cycles through the Biosphere: Bacteria in Action (1)

- Nitrogen fixed
 - Lightning
 - Nitrogen-fixing bacteria
- Nitrification
- Denitrification

Nitrogen Cycles through the Biosphere: Bacteria in Action (2)

- Human intervention in the nitrogen cycle
 - Additional NO and N_2O
 - Destruction of forest, grasslands, and wetlands
 - Add excess nitrates to bodies of water
 - Remove nitrogen from topsoil

Nitrogen Cycle in a Terrestrial Ecosystem with Major Harmful Human Impacts



Annual Increase in Atmospheric N₂ Due to Human Activities

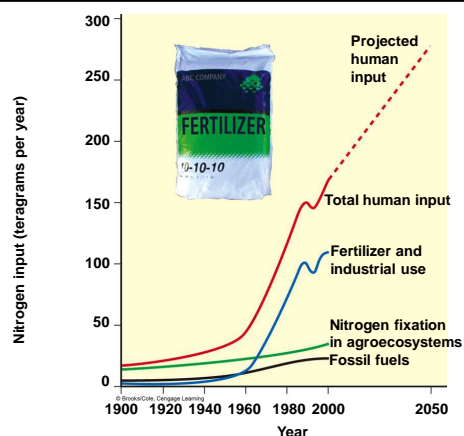
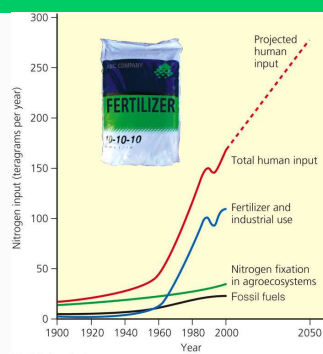


Fig. 3-20, p. 70

Phosphorus Cycles through the Biosphere

- Cycles through water, the earth's crust, and living organisms
- May be limiting factor for plant growth
- Impact of human activities
 - Clearing forests
 - Removing large amounts of phosphate from the earth to make fertilizers

Phosphorus Cycle with Major Harmful Human Impacts

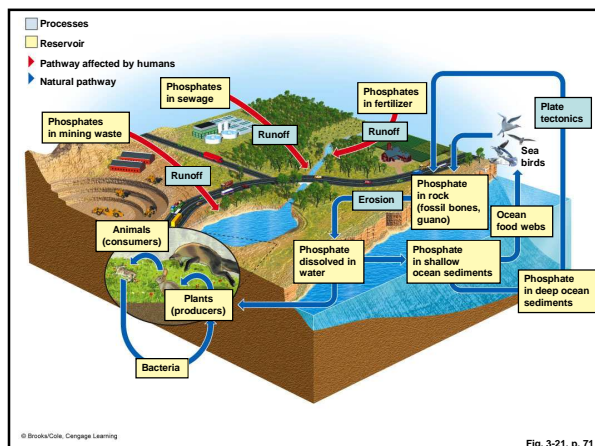
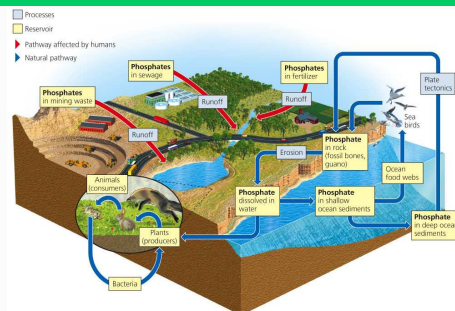


Fig. 3-21, p. 71

Sulfur Cycles through the Biosphere

- Sulfur found in organisms, ocean sediments, soil, rocks, and fossil fuels
- SO₂ in the atmosphere
- H₂SO₄ and SO₄²⁻
- Human activities affect the sulfur cycle
 - Burn sulfur-containing coal and oil
 - Refine sulfur-containing petroleum
 - Convert sulfur-containing metallic mineral ores

Natural Capital: Sulfur Cycle with Major Harmful Impacts of Human Activities

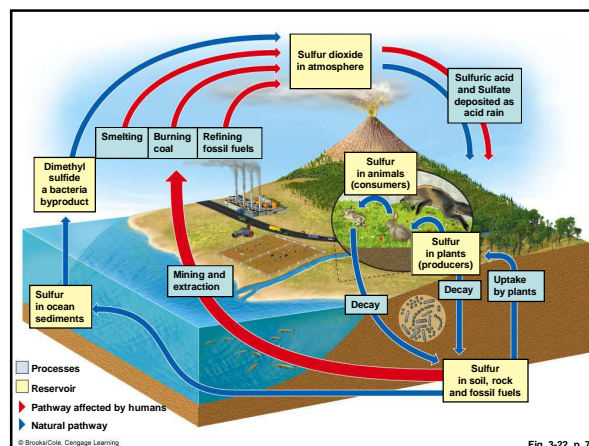
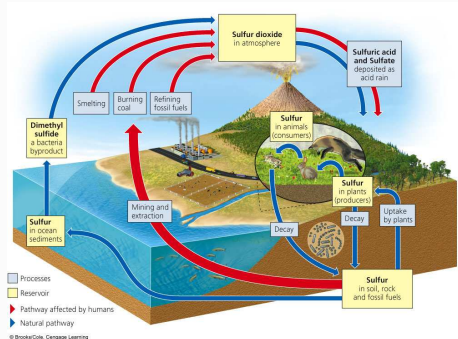


Fig. 3-22, p. 72